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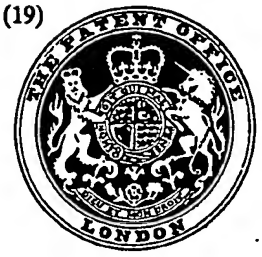

(54) "SOLAR ENERGY HEATER"

(71) I, DAMASIUS BENETTE IAN WICKRAMASURIYA, of 25 Vicarage Hill, South Benfleet, Essex, a subject of Sri Lanka, do hereby declare the invention, for which I pray that a Patent may be granted to me, and the method by which it is to be performed, to be described in and by the following statement:

The present invention relates to a device for heating liquids by means of solar energy, and hereinafter referred to as a solar energy heater.

Many forms of solar energy heaters are known in which solar heat is utilised to raise the temperature of a fluid, usually a liquid such as water. Many such heaters are bulky and cumbersome and require precise installation and location on site and are therefore not conveniently portable.

It is an object of the present invention to provide an easily portable solar energy heater of particular use in camping or domestic applications.

Accordingly the present invention is a solar energy heater for liquids comprising a flexible envelope formed of a first outer sheet of opaque material intended to rest on a support surface and a second outer sheet of transparent material intended to be exposed to solar radiation, said sheets being sealingly separated by a third sheet made of dark coloured thermally absorbtive material which constitutes a single common wall between a container for liquid which is also bounded by said first sheet, and a container for air which is also bounded by said second sheet, said liquid and air containers each having a closable opening to permit entry and exit of liquid and air respectively when required.

The envelope may be conveniently fabricated from plastic resin sheet materials such as a polyolefine, polyacrylate, polystyrene or P.V.C. Preferably, the sheet materials employed are flexible and the use of P.V.C. is especially preferred for fabrication of the sheet materials. The first lower sheet material is preferably coloured black e.g. a black P.V.C. sheet. The third sheet material is dark coloured e.g. black.

The envelope may suitably be formed from the sheet materials by sandwiching the sheets together and sealed together at their periphery by means of adhesive or welding. In an embodiment the lower liquid tight container may be constructed as a labyrinth by means of adhesive, or preferably heat sealing, to form a plurality of open compartments communicating with the inlet/outlet means.

The inlet/outlet means in the gas-tight chamber may comprise a single port provided with a suitable gas-tight closure. The inlet/outlet means in the liquid-tight chamber may comprise a single or plurality of ports provided with suitable liquid tight closures. In that embodiment wherein the liquid-tight chamber is constructed as a labyrinth inlet/outlet ports may be provided one at each end of the convoluted passageway.

The present invention is described further with reference to the accompanying drawings of a preferred embodiment and modifications thereof.

In these drawings:

Figure 1 is a plan view of a solar energy heater;

Figure 2 is an inverted plan view;

Figure 3 is a section on line A-A of Figure 2;

Figures 4 to 7 illustrate successive stages of inflation of the heater; and

Figure 8 illustrates one mode of installation.

Referring firstly to Figures 1, 2 and 3 the heater comprises an envelope 1 made of flexible P.V.C. and formed of an upper transparent sheet 2 and a lower opaque sheet 3 which is preferably coloured black.

A third sheet 4 of a dark colour, preferably black, to discourage algae is heat sealed around its periphery to the peripheries of the upper and lower sheets 2,3 so as to form an upper gas-tight container 5 when a central opening in the sheet 2 is closed by a cap 8. The sheet 4 is also additionally heat sealed to the lower sheet 3 to form a liquid-tight container 6 having a series of open compartments 6*a*. The container 6 has at one corner a main opening 7 for the inlet and outlet of liquid to be heated, and at the opposite corner an auxiliary opening 7*a* for a purpose hereinafter mentioned. Each of these openings is closable by means of a cap 9.

It is also preferred that the lower sheet 4 should be a 2-ply laminate comprised of a heat insulating base layer, and an upper membrane of material with a top reflective surface. The envelope has a pocket 11 at one end which accommodates a carrying handle 10 accessible centrally where the pocket has a recess 11*a*.

To prepare the solar heater for operation, a procedure explained with reference to Figures 4 to 7 is followed. Figure 4 shows the envelope totally collapsed for purposes of storage. Firstly, as illustrated in Figure 5, the caps 8 and 9 are removed from the envelope and liquid to be heated, e.g. water, is poured into the container 6 through the opening 7 until this container is filled, the cap 9 being then replaced.

Secondly (Figure 6) the top of the envelope is lifted from the centre so as to cause ingress of air to the top container 2; the cap 8 is then replaced and the envelope is released whereupon it has the appearance shown in Figure 7. Alternatively an air pump could be used to inflate the container 2.

The heater is then exposed to the heat of the sun and, after a suitable period of time, the water or other liquid heated by the solar energy is removed through one of the openings 7, 7*a*. The heated water may be used for any desired purpose e.g. as domestic water for cleaning or central heating purposes or for use in swimming pools. If suitable non-toxic materials are used to form the lower container 6 the water could be used for drinking.

EXAMPLE

In a specific example of the use of a solar heater as described above, the envelope 1 of size 6′ x 3′ with a liquid volume in the lower container of 2 gallons, was filled with water in the lower container at a temperature of 21°C. After exposure to solar energy for 50 minutes the water temperature had risen to 58°/59°C.

In a similar experiment water introduced at 16°C. was heated to a temperature of 34°/35°C. after a period of 30 minutes.

The solar energy heating device as above described is portable and the air container is readily inflatable.

The advantages of the separate compartments 6*a* in the liquid-tight container 6 are two fold.

Firstly compartments 6*a* impart stability of shape to the heater by ensuring that the liquid container 6 is of uniform thickness whether it is placed on a flat or on a sloping support surface, a feature which is of advantage when required to be used on camp sites and so forth.

Secondly the compartments serve to hold the designed volume of liquid in the liquid container and to spread it as a relatively flat layer throughout the container whilst also preventing accidental over-filling of the liquid container which would cause the latter to have a non-uniform depth between opposite side edges.

Figure 8 shows a mode of domestic use or installation of the heater. The heater is thus mounted on a platform 12 which is hingedly attached to the wall 13 of a house adjacent a room with a sink 14 and cold water tap 15. The platform is supportable by a stay 16 and the openings 7 and 7*a* are coupled respectively to a pipe 20 connected to the tap 15 and to a heated water pipe 21.

WHAT I CLAIM IS:

1. A solar energy heater for liquids comprising a flexible envelope formed of a first outer sheet of opaque material intended to rest on a support surface and a second outer sheet of transparent material intended to be exposed to solar radiation, said sheets being sealingly separated by a third sheet made of dark coloured thermally absorbtive material which constitutes a single common wall between a container for liquid which is also bounded by said first sheet, and a container for air which is also bounded by said second sheet, said liquid and air containers each having a closable opening to permit entry and exit of liquid and air respectively when required.

2. A solar energy heater as claimed in claim 1 in which the liquid container has a plurality of open compartments. Communicating with the closable opening.

3. A solar energy heater as claimed in claim 1 or claim 2 wherein there is an opening in said air container which is disposed substantially centrally in said second sheet, for permitting inflation of said air container as described with reference to Figures 4 to 7 of the accompanying drawings.

4. A solar energy heater as claimed in claim 1, 2 or 3 wherein the liquid container has two openings respectively at opposite corners thereof.

5. A solar energy heater as claimed in any of claims 1 to 4 in which the envelope is provided with a pocket which accommodates a carrying handle.

6. A solar energy heater as claimed in

claim 1 substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings.

7. A solar energy heater as claimed in claim 1 when installed substantially as hereinbefore described with reference to Figure 8 of the accompanying drawing.

REGINALD W. BARKER & CO.,
(Patent Agents for the Applicant)
13 Charterhouse Square,
London, EC1M 6BA.

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3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

FIG 1

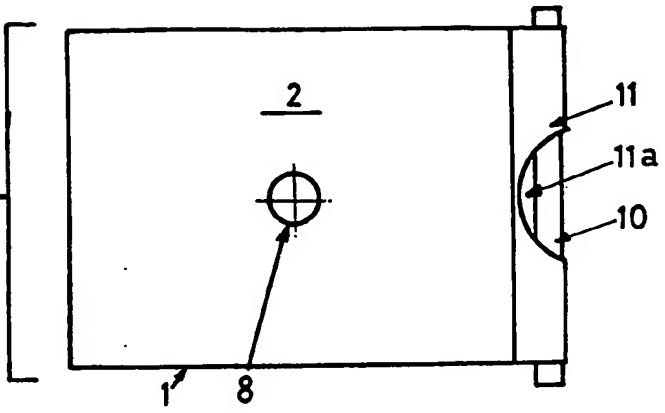


FIG 3

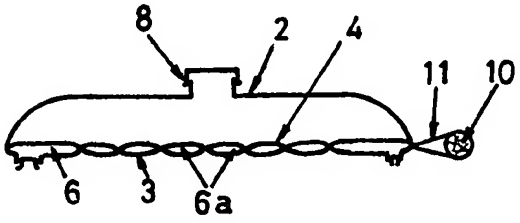
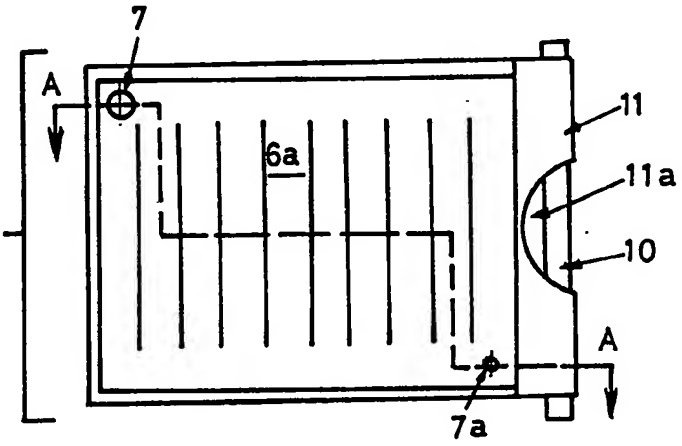


FIG 2



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1517449 COMPLETE SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

FIG 7

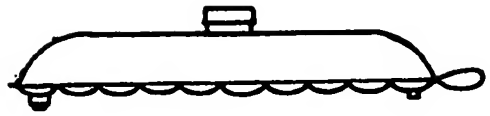


FIG 6

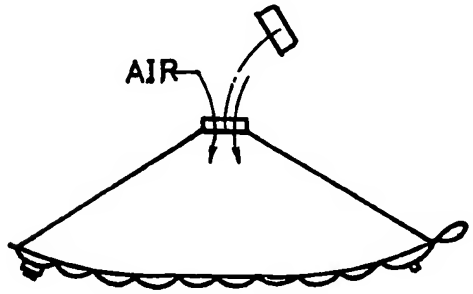


FIG 5

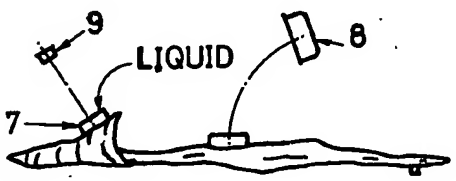
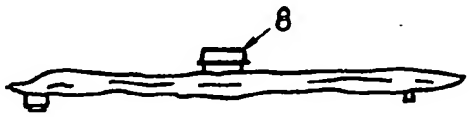


FIG 4



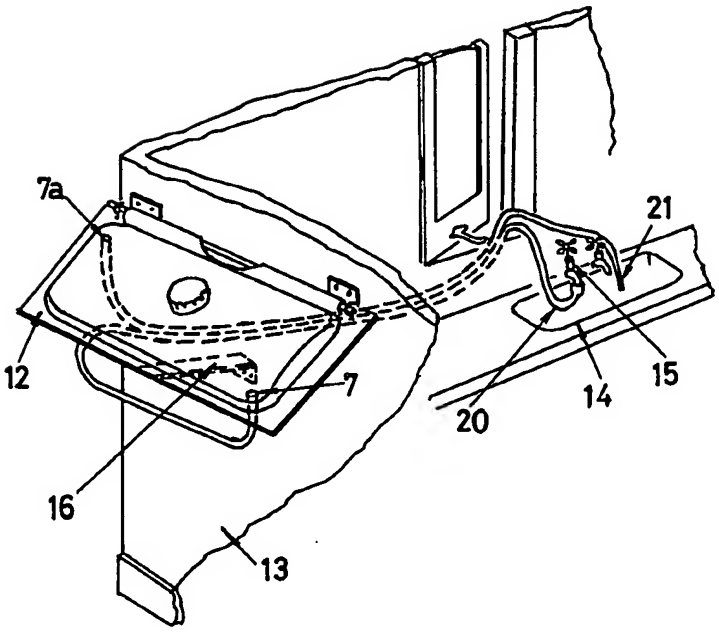


FIG.8